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19 June 1964

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MEMORANDUM FOR THE RECORD

SUBJECT: Comments on [redacted] 0817 Regarding OXCART Main Problem Areas and Dates for Attaining Performance Milestones

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1. The following comments represent the results of an initial analysis of the individual topics discussed in the subject wire. There is complete agreement on certain items; however, clarification and/or expansion is presented. Other of the items are not necessarily agreed to and, for these items, the reason for and explanation of the differences are noted. Regarding the four main problem areas cited by Lockheed which form the basis for the wire; namely, transonic excess thrust, fuel economy in cruise, stable inlet performance with matched recovery and temperature effect on high Mach number cruise, there is no disagreement.

2. There is no disagreement with the estimated 1500 pound increase in excess thrust derived from the results of the wind tunnel program. In addition, it is noted that the wind tunnel program for the ejector will be completed next week; however, the drawings for the proposed fix have already been started. The modification consists of installing tail flaps to the ejector with the big throat. The ejector with the big throat but without tail flaps has been flying on aircraft 131 for approximately one month. The parts for the modification will not be available until about August 10th.

3. Regarding the additional transonic excess thrust resulting from afterburner and engine modifications, one error is noted. The additional excess thrust increment

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of 1500-2000 pounds which will result from the installation of two "J" engines represents the total increase over the present configuration and is not in addition to the 500-1000 pounds estimated for the installation of two "J" afterburners.

4. The reduction in fuel economy attributed to the forward c.g. of the aircraft in cruise is factual and is the result of an added drag increment. At high Mach numbers the aircraft center of pressure (c.p.) moves aft and the amount of elevator deflection to trim which results in drag is a direct function of the distance between the c.p. and c.g. Therefore, moving the c.g. aft will reduce the required elevator deflection and correspondingly reduce the drag.

5. In addition to the comments regarding the recent success of the Bendix fuel control which are correct, it should be noted that recent improvements to the Hamilton Standard main fuel control show significant promise for improving the scheduling problems which occur with this control through the transonic region and the thrust droop condition which occurs at high Mach numbers.

6. Contrary to the remarks in the subject wire, inlet pressure recovery results from recent flight tests of aircraft 121 with the Hamilton Standard inlet control and aircraft 129 with the Lockheed inlet control reveals that, within the scatter of the data, the inlet pressure recovery for both controls is essentially the same and both are 4-6% below the matched inlet recovery at Mach 3.0. Also at Mach 3.0 inlet distortion is 16-20% indicating inefficiency in the overall inlet configuration.

7. To categorically state that the "latest flights on airplane 121, with the new "G" cam in the Hamilton Standard inlet control, showed generally poor performance" represents an incomplete report of the subject. The facts are that three flights have been conducted with the new "G" cam in the Hamilton Standard inlet control, only one of which was to Mach 3.0. In all three cases, indications are that the slope of the spike schedule versus Mach number line was parallel to the design schedule but may have been displaced by a constant amount which would cause a degradation of inlet pressure recovery. No major difficulty is anticipated to correct the displacement.

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8. Noteworthy progress is being made by Hamilton Standard towards the solution of the unstable inlet performance noted in the subject wire. Recent additional instrumentation on aircraft 121 revealed that coincident with reports of spike hammering there occurs an 80 cps oscillation in the pneumatic signal lines to the inlet control. Subsequently spike hammering was induced for the first time in a bench test by introducing a similar oscillation. Although not definite, one suspicion is that the oscillations are induced because the static pressure sensing ports are located in an unstable flow region where the transition from laminar to turbulent flow occurs. If additional tests confirm this suspicion, it should not be too difficult to induce turbulent flow ahead of the static pressure sensing ports.

9. With reference to the prolonged operation at design Mach number, one cannot argue too vigorously against the more conservative approach outlined by Lockheed since the difference in temperatures between Mach 3.0 and 3.2 should be approximately 100°F. However, considering the status of the major problem areas discussed above, the September 15 date for a limited Mach 3.0 capability appears somewhat optimistic. Only after sustained flights of two hours duration have been conducted will there be any evidence regarding the engine sustained capability as well as the ability of the various materials and systems to function properly. Therefore it is our considered opinion that December 1 is a more realistic date for the Mach 3.0 capability with a range of 3400 n.m.

10. Hopefully by April 15, 1965 we would expect to be able to demonstrate complete Mach 3.2 missions, including three air refuelings on a repeated basis. Then, and only then, would the system be labeled fully operational.

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Aircraft Systems Division
(Special Activities)

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